ANNALS
of CARNEGIE MUSEUM

4400 FORBES AVENUE • PITTSBURGH, PENNSYLVANIA 15213

VOLUME 44 DECEMBER 20, 1972 ARTICLE 2

THE BOUNDARY BETWEEN *SATYRIUM LIPAROPS* AND ITS SUBSPECIES *STRIGOSUM* (LEPIDOPTERA: LYCAENIDAE)

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The nominate subspecies of *Satyrium liparops* Le Conte, 1833, is so scarce in collections that at one time its very existence was doubted (Michener & dos Passos, 1942). Only a few individuals have been described and discussed in print (Forbes, 1943; Klots & Clench, 1952) since the species was named, well over a century ago.

Mr. Leon Neel, of Thomasville, Georgia, recently presented to Carnegie Museum a fine series of over 40 specimens of *Satyrium liparops* that he collected at various localities in southern Georgia and northwestern Florida. These specimens, along with earlier records and a few additional southeastern specimens, shed new light on nominate *liparops,* especially on its geographical range and intergradation with the more widespread northern subspecies *S. l. strigosum* Harris.

John Abbot, the discoverer of nominate *liparops,* was well acquainted with it, and his manuscript notes, as quoted in Scudder (1872, 1889), bear repeating. He called *liparops* "the Ogeechee brown hair streak butterfly" and considered it to be very rare. Nonetheless he reared it several times and recorded its larval foodplants as holly, a "narrow leaved, jagged, black jack oak" [probably *Quercus catesbyi,* according to Scudder], *Quercus rubra,* and other oaks. He found the duration of the pupal stage to be from 8 to 18 days [Scudder questions the shorter period]. Abbot noted that adults appear early in May, frequent "oak fields and swamps," and that there is only one brood.

Major John E. Le Conte[1] also knew *l. liparops,* either from personal

[1]As he spelled it himself (cf. Scudder 1889, frontispiece). In Boisduval & Le Conte (1829-1834) it is invariably spelled "Leconte."

Submitted for publication May 20, 1971.

observation or from the notes and paintings of Abbot, it is not clear which.

Boisduval, however, was skeptical. Immediately preceding the original description of *liparops* (Boisduval & Le Conte, 1829-1834 [1833]: 97-98) he inserted a signed *Observation* in which, among other things, he states that *liparops,* as represented by Abbot's painting, "has the greatest resemblance with the *Favonius* of Smith." Farther on he writes, ". . . the so-called new species figured on this plate [31] under the name of *liparops* should be considered the true *Favonius* of Mr. Smith; but because Abbot and my collaborator do not entirely share this view, I have had to yield provisionally to the authority of persons who have made their observations on the spot." The description of *liparops,* on the following page, is credited to Le Conte alone. Boisduval, it appears, declined to accept any responsibility for it!

Despite Boisduval's opinion, and the complete absence of any known specimens, the name *liparops* was not questioned by later authors until 1942, when Michener & dos Passos concluded (independently of Boisduval's remarks, it seems) that it should be made a synonym of *favonius* and the species name *liparops* replaced by *strigosum* Harris.

This synonymy was short-lived. The next year Forbes (1943) published a photograph of a female *l. liparops* from the Okefenokee Swamp in southeastern Georgia. Taken in 1912, this may be the first specimen of nominate *liparops* to have been collected since Abbot's day. Forbes reviewed the situation and concluded that *liparops* should be restored to its previously accepted sense, a conclusion that was entirely justified and has not since been questioned.

From 1943 to the present a few examples of nominate *liparops* have been reported (Klots & Clench, 1952), and in my brief description of the range of *liparops* (Clench, 1961), the statement ". . . southward to northern Florida" was based on the Pellicer Creek specimen listed below.

The type locality of *liparops* is given in the original description simply as "Georgie." Klots (1951) designated Screven Co., Georgia, without explanation, but presumably because Abbot lived there. There is interesting confirmation of this, however, in the common name that Abbot gave to *liparops* (see above). Ogeechee is the name of the river that forms the southwestern boundary of Screven County; it is also the name of a small creek that courses through the middle of the county; and finally, it is the name of a small town, also in the county. We may never know which of the three Abbot had in mind, but he undoubtedly found his *liparops* somewhere in Screven County.

So far as I know, few of Abbot's specimens have survived to the present, and no type of *liparops* is known to exist. One specimen in Carnegie Museum is from 10 miles north of Savannah, only about 35

miles from the presumed type locality, but for two reasons I am unwilling to make a neotype of it: (1) its condition is poor, lacking several actually or potentially useful characters; and (2) the change from *l. liparops* to *l. strigosum* probably occurs near the type locality. The nature of this change is such that 35 miles is by no means close enough for the specimen to be reliably representative.

Nominate *liparops* differs in several ways from the widely distributed, generally more northern, subspecies *strigosum.* The most conspicuous difference is the presence in *l. liparops* of a large patch of fulvous orange on the forewing upperside. This patch occurs in both sexes, but averages a little larger in males. Both tails on the hindwing are longer than in northern *strigosum,* but in *strigosum* from southwestern Georgia and northwestern Florida they are fully as long as in nominate *liparops.* The nominate subspecies averages somewhat larger than northern *strigosum,* but the difference is slight. The orange subterminal crescents on the hindwing underside are somewhat larger in *l. liparops.*

For present purposes I have adopted the development of the fulvous forewing patch as the primary trait separating the two subspecies, but it should be borne in mind that other relevant characters also exist, and some, at least, do not vary in the same geographic pattern.

In order to measure this fulvous patch, I selected six specimens to represent a graded series over the full observed range of its variation, at about equal intervals of development. I scored them numerically from 0 (complete absence of fulvous) to 5 (a large patch of fulvous, from inner margin costad to M_1, and from before middle of wing distad to within about 2 mm of the termen, the whole patch roughly 6 x 7 mm). Using this set of six as a reference scale, each of the studied specimens was assigned a score value. The females figured by Boisduval & Le Conte (1833) and by Forbes (1943) were also evaluated, as were several specimens in the American Museum of Natural History. The results are given below.

LOCALITIES

The following list includes all records (known to me) of any form of *liparops* from the states of Alabama, Georgia, and Florida. Where specimens were available I list the score values. Institutional abbreviations are explained under Acknowledgments.

Alabama

Pike Co.: Spring Hill, I.v (Univ. Michigan), recorded in my notes as *strigosum,* but I have no other information.

Mobile Co.: Mobile, 1926. 1♀, score 0 (AMNH).

Georgia

Fulton Co.: Atlanta (Knudsen, 1955).

Bibb Co.: Macon, 13.v-6.vi (Harris, 1950), reported as *strigosum,* but no other information given; in AMNH 1♂, *leg.* Eustis, no date, score 0.

Screven Co.: (Abbot, *per* Scudder, 1889), the figure of a female in Boisduval & Le Conte, 1833 (pl. 31, fig. 1) has a score of 4.

Chatham Co.: 10 mi N of Savannah, 25.v.1954 (*leg.* J. Bauer, CM), 1♂, score 3.—Savannah (*leg.* H. L. King), ". . . consistently has a large fulvous patch on each forewing" (Klots & Clench, 1952); these specimens in AMNH, 10-20.v.1949/1950, 4♂, scores 2,4,4,4.

Lee Co.: Leland Farms, 13.v.1967 (*leg.* L. Neel, CM), 2♂, scores 0,1; 2♀, scores 0,1.

Dougherty Co.: Albany, 13.v.1967 (*leg.* L. Neel, CM), 1♂, score 0.

Baker Co.: Pineland Plantation, 17.v.1966 (*leg.* L. Neel, CM), 1♂, score 2.

Grady Co.: ½ mi N Hadley Ferry Bridge, 26-28.v.1966 (*leg.* L. Neel, CM), 3♂, scores 1,3,3; 4♀, scores 0,0,1,2.—Sherwood Plantation, 29.iv.1968 (*leg.* L. Neel, CM), 1♂, score 4.

Thomas Co.: Thomasville, 21.v.1969 (*leg.* L. Neel, CM), 1♀, score 0.—Barwick, 21.v.1969 (*leg.* L. Neel, CM), 1♀, score 0.

Echols Co.: Statenville, 18.v.1967 (*leg.* L. Neel, CM), 2♂, scores 5,5; 9♀, scores 2,3,3,4,4,4,4,4,5.

County ? (Charlton, Clinch, or Ware): Honey Island, Okefenokee Swamp, 1.vi.1912 (Forbes, 1943), 1 , score 4.

Florida (See also Postscript)

Escambia Co.: 6.v (Kimball, 1965).

Leon Co.: Tallahassee, 20.v (Kimball, 1965), "impossible to say whether this is typical *liparops* or the form [*sic*] *strigosa*" [I assume, therefore, that it is an intermediate].

Liberty Co.: Telogia, 22,23 v.1965, 22.v.1966, 9.v.1967, 24.v.1969 (*leg.* L. Neel, CM), 8♂, scores 0,1,1,2,2,2,3,4; 7♀, scores 0,0,1,1,1,2,2.—20 mi SSE Telogia, 24.v.1969 (*leg.* L. Neel, CM), 1♂, score 3.

Waukulla Co.: Crawfordville, 11.v.1969 (*leg.* L. Neel, CM), 1♂, score 2.

Flagler Co.: Pellicer Creek, 13 mi N Bunnell, 30.iv.1954 (*leg.* J. Bauer, CM), 1♀, score 5, the southernmost known record of the species.

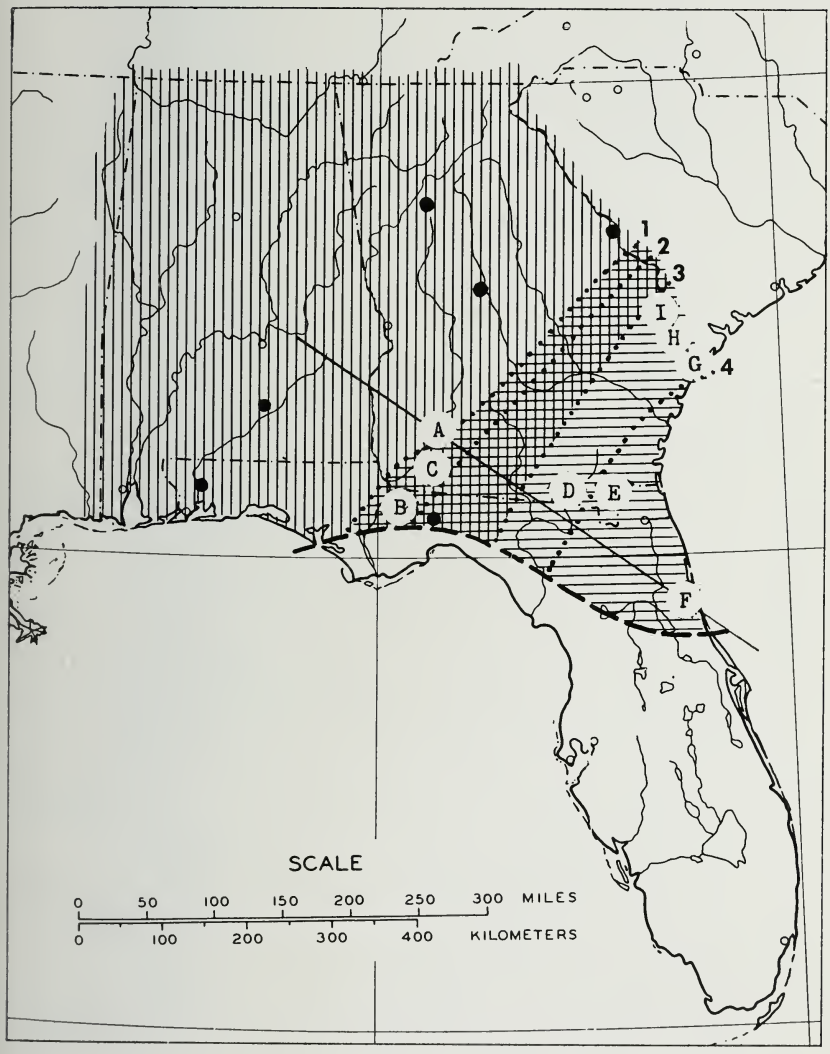
ANALYSIS: The preceding data are enough to provide at least preliminary answers to three questions: What is the range of *l. liparops?* How does it intergrade with *strigosum?* Is there evidence indicating either primary (clinal) or secondary (hybrid) intergradation?

1. *Range:* Given an adequate sample from a locality, the scores may be averaged to give a figure representative of that locality. With enough such localities, suitably disposed, a set of contours could be

Fig. 1. Map of Alabama, Georgia, and Florida showing partial distribution of *Satyrium liparops.* Heavy dashed line marks the approximate known southern limit of the species. Vertical hatching, ssp. *strigosum*; horizontal hatching, ssp. *liparops*; cross-hatching, zone of transition. Large solid dots, literature records, amount of fulvous unknown (but see text). Lettered circles, localities with fulvous known, as follows:

A = Lee + Dougherty cos., Ga., 3♂2♀(av. score 0.4).
B = Liberty + Waukulla cos., Fla., 10♂7♀(av. score 1.6).
C = Baker + Grady + Thomas cos., Ga., 5♂6♀(av. score 1.5).
D = Statenville, Echols Co., Ga., 2♂9♀(av. score 3.9).
E = Honey Island, Okefenokee Swamp, Ga., 1♀(score 4).
F = Pellicer Creek, Flagler Co., Fla., 1♀(score 5).
G = Savannah, Chatham Co., Ga., 4♂(av. score 3.5).
H = 10 mi N Savannah, Chatham Co., Ga., 1♂(score 3).
I = Screven Co., Ga., 1♀(score 4).

The solid diagonal line through A and F is the transect (see text and fig. 2).


1
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SCALE
0 50 100 150 200 250 300 MILES
0 100 200 300 400 KILOMETERS

drawn showing the spatial change in the degree of fulvous, in effect mapping the range of nominate *liparops* and its transition to *strigosum.*

Satyrium liparops is altogether too rare to expect anything that approaches this ideal in the near future. Mr. Neel's samples, however, are remarkably large for such a scarce species, and they are well disposed. Accordingly I have attempted such a map, even though it has to be approximate rather than precise and definitive. Some of Mr. Neel's locality samples are large enough to be roughly representative in themselves. Others, though small individually, are close enough to each other to be combined into a single average score (e.g., the several stations in Thomas, Grady, and Baker counties, Georgia). In all instances I have had to combine both sexes into the average. The resulting loss of precision is surely small in relation to other uncertainties.

In the map (fig. 1) and in subsequent discussion, I have considered that an average score of less than 1.0 represents *liparops strigosum;* that an average score over 3.0 represents *liparops liparops;* and that an average score between 1.0 and 3.0 represents an intermediate or transitional state. The zone between these values is therefore indicated on the map as the region of transition between the two subspecies.

This map shows that *l. liparops* occupies the southeastern corner of the species range and extends from northeastern Florida northeastward along the coast at least as far as the South Carolina-Georgia line. How much farther it may continue is still unknown for want of material.[2] Although this area is small, the region of transition is smaller still. The change from one subspecies to the other occurs in a narrow band, not much over 60 miles wide.

2. *Transect:* The best samples, as it happens, are grouped rather strategically near a line, crossing and perpendicular to the zone of transition, roughly from Lee and Dougherty counties in Georgia to Pellicer Creek in eastern Florida (see line on map, fig. 1). Plotting the average degree of fulvous development along this line gives the results shown in figure 2. The gradient is obviously steepest at the northwestern (*strigosum*) end, gradually flattening to the southeastward.

3. *Nature of the intergradation:* If a species extends its range in a particular direction and forms subspecies along the way by gradual evolution, the result is called primary intergradation (a cline). Variability of individual populations generally will be comparable throughout, even though the mean value of a variate may change considerably. The change in the mean value along a gradient will often, though not necessarily always, be gradual. If, on the other hand, two subspecies

[2]Mr. Ronald R. Gatrelle, of Charleston, South Carolina, informs me (*in litt.,* 27 June 1971) that he has taken a single female of *liparops* near Charleston. This specimen has small orange patches on the forewings (score probably 2 or 3, according to his sketch), and thus extends the region of transition between the two subspecies at least as far north as Charleston, about as expected.

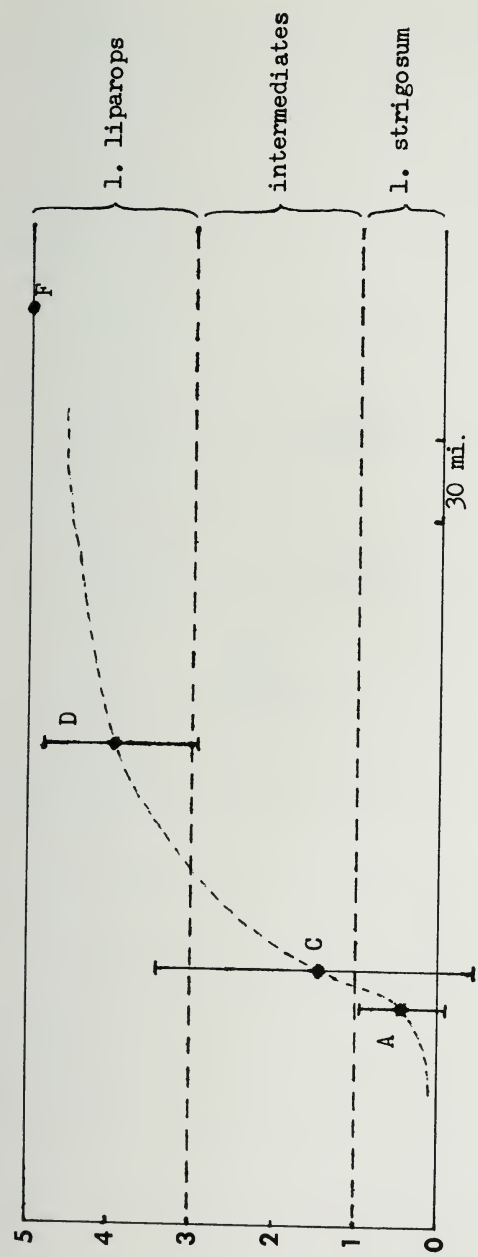

Fig. 2. Transect from localities A to F, showing average amount of fulvous in localities near the line. Letters refer to localities as in fig. 1. Bars represent 1 σ on either side of the mean.

evolved in isolation and subsequent range changes throw the now differentiated forms into contact, then a zone of hybridization or "secondary intergradation" will develop, characterized in part by greater variability of populations within the zone of contact than on either side, and by an abrupt change in the variate mean (sometimes called a "step cline") across the zone.

The character gradient in the transect (fig. 2) shows that the transition from *strigosum* to *l. liparops* is indeed abrupt, occurring over a distance of about 60 miles. The present samples also suggest that vari-

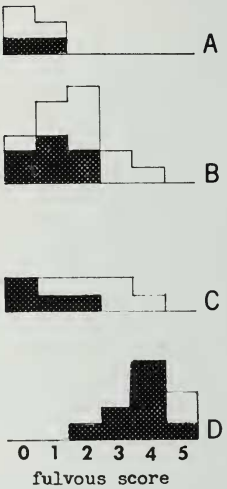

Fig. 3. Histograms showing frequency distribution of amount of fulvous in populations near transect line. Letters refer to localities as in fig. 1. Shaded parts, females; unshaded parts, males.

ability is greater within the transitional zone than outside it. The four largest samples are represented in histograms (fig. 3) showing the frequency distribution of the amount of fulvous in each. Note that the distribution is more compact in samples outside the zone of transition (A, D; σ = 0.55, 0.92, respectively), and more extended in the two samples from within the zone (B, C; σ = 1.44, 1.43, respectively). The coefficient of variation (V) was calculated for the two largest samples, B (Telogia, Fla.) and D (Statenville, Ga.). The former, from within the zone of transition, has V = 82; the latter, from outside the zone in the area of *l. liparops,* has V = 24: again suggesting increased variability within the zone of transition.

Thus three different types of evidence—the abrupt change from one subspecies to the other (figs. 1, 2), the form of the histograms (fig. 3), and the coefficients of variation—all agree in indicating that the zone of transition is probably a hybrid zone.

ENVIRONMENT

Mr. Neel has furnished habitat descriptions of most of the localities where he has taken *liparops*. These are given below, together with dates and average scores of the specimens taken.

Leland Farms, Lee Co., Ga. 13.v.1967, 2♂, 2♀. Av. score 0.5, ssp. *strigosum.*

"These specimens were collected on the flowers of Chinese Chestnut (*Castanea* sp.) trees in two groves of these trees separated by a hardwood drain with a creek. The hardwood was mostly oak and gum and has been timbered in the past. The *liparops* all occurred in the first and second lines of trees and never out in the groves. Fire frequency in the hardwood area very infrequent." [L.N.]

Albany, Dougherty Co., Ga. 13.v.1967, 1♂(score 0), ssp. *strigosum.*

"This specimen was collected while [it was] visiting the flowers of Chinese Chestnut. These nut-bearing trees were planted in an old dooryard development immediately adjacent to the hardwood area along the Flint River. This hardwood area in a state of nature began where the open pineland upland stopped and in most areas is semi-swamp (oak, elm, hickory, plus gum and cypress in the low areas) as compared to the mud flat swamps in western Dougherty Co., which contain sweet, black and tupelo gum with oaks, etc. Fire frequency none now but probably burned during extreme drought periods until more or less recently." [L. N.]

Pineland Plantation, Baker Co., Ga. 17.v.1966, 1♂(score 2), intermediate between *liparops* and *strigosum.*

"This specimen was visiting the flowers of New Jersey Tea (*Ceanothus americanus*) growing in open pineland immediately adjacent to the hardwood fringe along the Flint River. Fire frequency where the *Ceanothus* was growing is very regular, but across the fire line in the hardwood area it is very infrequent, probably occurring only during major droughts." [L. N.]

Hadley Ferry Bridge (½ mile north), Ochlocknee River, Grady Co., Ga. 26-28.v.1966, 3♂, 4♀. Av. score 1.4, intermediate population.

"These specimens were all collected while they were visiting the flowers of Chinquapin (*Castanea* sp.), on a sand ridge of about 30 acres that was at one time open pine woods, immediately adjacent to the river swamp of the Ochlocknee River. Poor site, plus indiscriminate timber cutting in the past, has allowed this scrub area to develop with a fire frequency now of about every 5 years. River swamp is burned only during extreme droughts." [L. N.]

Sherwood Plantation, Grady Co., Ga. 29.iv.1968, 1♂(score 4), probably an intermediate population.

"This butterfly was collected while it visited the flowers of a sparkleberry bush (*Batedendron arboreum* Marsh). The area was open pineland between two creeks with accompanying hardwood forest, the creeks about ¼ mile apart. Fire frequency in the area irregular for the past twenty years (my personal experience), with the average about every third year." [L. N.]

Statenville, Echols Co., Ga. 18.v.1967, 2♂, 9♀. Av. score 3.9, ssp. *liparops.*

"All specimens were collected while they were visiting the flowers of an unidentified shrub growing as part of the understory of a small hardwood drain leading into the Allapaha River. This river at Statenville has a very narrow hardwood fringe, in most areas with the pinelands growing right up to the river banks. Fire frequency at one time was quite regular in the pinelands, but complete fire exclusion has been practiced for the past six to eight years. Hardwood areas only burned during drought periods." [L. N.]

Telogia, Liberty Co., Fla. 22,23.v.1965, 22.v.1966, 9.v.1967, 24.v.1969, 8♂, 7♀. Av. score 1.5, intermediate population.

"The 1965 specimens were collected (along with a fine series of *S. kingi* Klots & Clench) while they visited the flowers of a chinquapin. This tree was located in a roughly two acre patch of woodland between a highway and a railway track. Along the highway on both sides are several very large oak trees and the chinquapin was in a small opening more or less under the large oaks. The remaining area was a patch of slash pine timber. The entire area was obviously at one time a part of a homestead where the owners planted fruit trees, flowers, etc., very extensively. This area has experienced no fire in years and the little slash pine woods have grown up into ty-ty, *Azalea* sp., *Arundinaria* sp. and other shrubs under the slash pine overstory. *Lethe portlandia* occurs here. Out under the large oaks typical scrub is coming in (water oak, Wisteria, plum, etc.). In 1966 we found that the chinquapin had died, but across the highway in the dooryard of the homestead was a fine Chinese Chestnut tree in full bloom. All specimens from that date on were collected on this tree. The site is in the town and is surrounded by small patch farms, dwelling sites, woodlots, etc.: a rural setting." [L. N.]

DISCUSSION

Satyrium liparops reaches its southern limit in northern Florida, the heavy dashed line in fig. 1 indicating its approximate location. The course of this line is based not only on the plotted localities, but on negative evidence from below the line: extensive collecting in peninsular Florida south of Gainesville has never brought *liparops* to light, nor have the considerable efforts of Mr. Neel in western Florida south and west of Tallahassee. Nonetheless, negative evidence being what it is, this line must still be considered quite tentative. Mr. Neel states that apparently suitable environments for *liparops* are found in western Florida at least as far south as the Suwanee River.

The positions of nominate *liparops* and subspecies *strigosum,* the position of the southern species boundary, and the nature and position of the presumptive hybrid zone, all combine to suggest that during the Wisconsin glacial maximum, over 12,000 years ago, nominate *liparops* was displaced far southward, probably occupying southern peninsular Florida, and that it was separated from subspecies *strigosum* by an area (probably in peninsular Florida) in which neither occurred. This possibility is reinforced by the occurrence of a large number of other taxa-pairs that now hybridize in roughly the same area, termed Suture Zone II, and extensively discussed, by Remington (1968).

The land area of Florida alternately grew and shrank on a large scale during the Pleistocene (MacNeil, 1950; Neill, 1957; Zug, 1968). During the glacial periods, when vast amounts of water were impounded in the ice sheets, the shore line was extended seaward of its present location. The increment was slight along the eastern and southern perimeter, but so great along the western coast that the land area of the peninsula was more or less doubled. During the interglacials the sea rose, often well above its present level, and at these times Florida consisted of little more than a small remnant archipelago along the axis of the state, extending southward at the farthest to about the latitude of Lake Okeechobee.

During the Wisconsin glaciation, then, the peninsula was large and available for the suggested southward displacement of ancestral nominate *liparops*. This displacement is also consistent with climatic changes postulated for Georgia, Florida, and the West Indies during Wisconsin time (Neill, 1957; Clench, 1964; Watts, 1970).

A major question is what kept the two *liparops* subspecies apart during the Wisconsin. *S. liparops* is distributed today in a rough continum in the area. There is no obvious physical aspect of the environment that reasonably could be used to explain a Wisconsin-time range disjunction.

In southern Georgia and the adjacent part of Florida, two types of forest are particularly prevalent. One is an open pine forest (mostly Long Leaf and Slash Pine), the other a mixed broadleaf hardwood forest whose principal constituents are beech, Sweetgum, magnolia, hickory, and Spruce Pine. The latter type is climax, but the climax is reached only in areas long protected from fire. Elsewhere the pine forest prevails: fire-tolerant, open, often park-like stands of pine with an understory that may vary from little more than grass and herbs to a fairly dense shrub stratum, depending on the frequency of fires, which are a natural part of this environment (see below).

Satyrium liparops in this area appears to be strongly associated with the interface, or ecotone, between these two forest types. It may be found literally at the boundary, or it may occur in one or the other type, but never far from the boundary. To judge by known occurrences as just described, and by analogy with some other hairstreaks, it is possible that larval feeding and perhaps mating and roosting may occur in the hardwood forest, while adult feeding may take place mostly at the boundary or in the pine forest.

It seems unlikely that *liparops* could occur in either type alone. The hardwood forest would be too shaded, and would probably support too few food flowers for adults. And, as Mr. Neel has observed in numerous samplings, it does not occur in pine forest far from a hardwood area.

Remington (*loc. cit.*) suggests that a moist, dense forest may have been the barrier that divided many of the taxa-pairs he discusses. He points out that several of these taxa-pairs favor semi-wooded, scrubby habitats, and that a moist, dense forest would have been a barrier to them. Such a forest, if of nearly continuous distribution, could have been an effective barrier to *liparops* as well. A forest of this kind must have been located in Florida, probably well southward in the peninsula. Watts (1970) describes the full (Wisconsin) glacial flora in Bartow Co., northwestern Georgia, which is quite similar to a contemporaneous one in eastern North Carolina. This flora consisted of a mixed association of *Pinus banksiana, Picea,* some *Quercus, Carya,*

and a large number of other species. The nearest equivalent of this association today is found in northern New England, so the Bartow Co. flora represents a southward displacement of some 700 miles. A corresponding southward displacement of the present range of nominate *liparops* would have eliminated it completely. Assuming, then, that there has been (as there must have been) a certain amount of equatorward compression of life zones, this moist, dense forest probably occurred far southward in Florida, perhaps at about the latitude of Lake Okeechobee.

As was stated above, *liparops* seems to require both the hardwood and the pine forest, and hence could have occupied its present area only when the patchwork forest pattern of today had become established. If the antecedent barrier was a continuous hardwood forest, then the contact of the two subspecies and their consequent hybridization must date from the establishment of the pinelands vegetation in the area.

Remington believes that the pine forest type was probably a product of human disturbance: frequent burning, first by precolonial Indians and then by early European settlers.

For two reasons I doubt that human disturbance has been a significant factor in the origin of this subclimax vegetation type. First, the pinelands communities are fire-adapted (Harper, 1914, esp. p. 184), and the adaptations are many, diverse, and extend to both plant and animal components (Stoddard, 1963). We can only conclude that tolerance to fire was developed long before the arrival of early man in the area—indeed, long before he arrived in the New World. Second, man would by no means have been necessary to set the fires, many of which could have been caused by lightning (Harper, *loc. cit.*; Komarek, 1964). Indians and early settlers assuredly used fire to manipulate their environment, but they were merely perpetuating a long established natural process.

In brief, the fire-conditioned environment had to come in first (cf. Stoddard, 1964). Its arrival may nonetheless have been relatively recent, geologically, spreading in from adjoining areas where, with *liparops,* it had existed earlier; but if we are to find an explanation for its presence in the area, then the explanation must be in some change in climate rather than in human activity.

POSTSCRIPT

In August, 1971, after this manuscript had been completed, I received for study and determination a series of *S. liparops* taken by Mr. R. Kergosien in coastal Mississippi, some 250 miles west of the area from which most of the above samples came. These records are as follows:

Mississippi

Hancock Co.: Fenton, 9.v.1971 (*leg.* R. Kergosien), 2♂, scores 1,1; 1♀, score 0.

Harrison Co.: Big Biloxi Recreation Area [ca. 10 mi N Gulfport], 17.v.1970, 15-30.v. 1971 (*leg.* R. Kergosien), 1♂, score 1; 5♀, scores 0,0,0,0,1.

The average score of this combined lot, 9 specimens in all, is 0.44. While placing the population clearly in *strigosum* as defined above, the fulvous score is unexpectedly high for so far west. It raises the possibility that the western edge of the zone of intergradation may course farther west at its southern end than shown on the map (fig. 1).

All these Mississippi specimens have the long tails and the more extensive orange lunules on the hindwing underside that seem to characterize southernmost *liparops strigosum.*

Florida

Alachua Co.: Gainesville, 19.v.1972 (*leg.* H. Clench, sta. 126), 1♀, score 3.

This single specimen was taken at the edge of a suburban housing development, literally at the interface between an old, possibly virgin, hardwood hammock and a remnant area of a roughly 20-year-old, abandoned Slash Pine plantation, on a Sweetgum leaf about 8 feet above the ground. The habitat conforms perfectly with that postulated above for the species. Although new for the Gainesville area, this record falls within the species range shown on the accompanying map.

ACKNOWLEDGMENTS

I am especially grateful to Mr. Leon Neel, Thomasville, Georgia, for several reasons: first, his presentation to Carnegie Museum (abbreviated CM) of the remarkable series of *Satyrium liparops* on which this paper is principally based; second, his careful notes on the habitats where he has taken *liparops*; third, his discussion of the ecology of *liparops* in correspondence, and his help with several literature references; and last, but by no means least, the hospitality that he and his family extended to my wife and me during a visit in the spring of 1969, which included visits to several of the major environmental types discussed in this paper. I also thank Dr. Frederick H. Rindge, of the American Museum of Natural History (AMNH), New York, for his kind permission to study the *liparops* material there; and Messrs. R. Kergosien and Bryant Mather, of Bay St. Louis and Clinton, Mississippi, respectively, for the opportunity to study the Mississippi material discussed in the postscript.

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